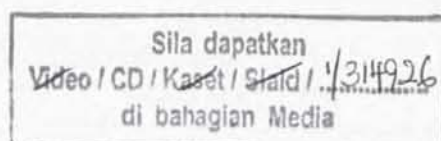


**EFFECTS OF DIFFERENT FEEDS FOR THE  
SURVIVAL POTENTIAL ON EARLY LARVAL  
STAGE OF WHITE BLOTCH SNAPPER,  
*LUTJANUS RIVULATUS***

**CHING FUI FUI**

PERPUSTAKAAN  
UNIVERSITI MALAYSIA SABAH



**BORNEO MARINE RESEARCH INSTITUTE  
UNIVERSITI MALAYSIA SABAH**

**2007**



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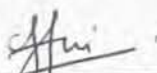
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The materials in this thesis are original except for quotations, excerpts, summaries and references, which have been duly acknowledged.

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## ABSTRACT

### EFFECTS OF DIFFERENT FEEDS ON THE SURVIVAL POTENTIAL OF EARLY LARVAL STAGE OF HOI TAI KAI, *LUTJANUS RIVULATUS*

The high mortality in the early larval stage of Hoi Tai Kai, *Lutjanus rivulatus* had caused to the failure in seed production. Three factors were responsible for the mass mortality: Small body size at hatching (2.19 mm), small mouth size at first feeding (80  $\mu$ m) and short nutrition transition period (18 hours). The difficulty of larvae to consume rotifer, *Branchionus* sp. had restricted the success first feeding. The available rotifer (150-230  $\mu$ m) is considered too large for the small mouth size larvae to consume. Five artificial feeds and two live feeds were tested as starter feed in this study: boiled egg yolk (BE), cod oil juice (COJ), raw egg yolk (RE) and combination feeds of BE and COJ (BE+COJ), combination feeds of BE and RE (BE+RE), rotifer and natural plankton. The effect of these different feeds to the survival potential of larvae was indicated. Finding shows larvae were only able to consume artificial feed based on the gut content observation. BE was found able to contribute the highest survival rate ( $87.7 \pm 3.3$ ) and larvae succeed to survive in 9 dAH. The factors cause BE to become the most effective starter feed for larvae. Several factors responsible for the success use of BE: consumable by larvae, offer wide range of size (10-180  $\mu$ m), highly preferred to be consume, Chesson index  $\alpha$  (0.99), short gut passage time at the first feeding day (30 minutes), resembles an attractive feed for the visual feeder larvae to detect feed in the rearing water as well as able to being nutritious feed for larvae.

Keywords: *Lutjanus rivulatus*, first feeding, survival potential, selectivity of feed size, selectivity of feed type.

## ABSTRAK

Kadar kematian yang tinggi pada Hoi Tai Kai, *Lutjanus rivulatus* pada peringkat awal lavi telah membantutkan usaha pengeluaran benih ikan ini. Tiga faktor telah dikenalpasti menyebabkan kematian lavi: menetas pada saiz badan yang kecil (2.19 mm), saiz mulut yang kecil pada hari makan pertama (80  $\mu\text{m}$ ) dan masa penukaran nutrisi yang pendek (18 jam). Ketiga-tiga faktor ini telah menyebabkan kesukaran lavi untuk makan pada hari makan pertama. Rotifer, (150-230  $\mu\text{m}$ ) makanan asas pada lavi adalah terlalu besar untuk lavi memakannya. Justeru ini, lima jenis makanam tiruan: rebusan kuning telur ayam (BE), jus minyak kod (COJ), telur ayam mentah (RE), kombinasi BE dan COJ (BE+COJ) dan kombinasi BE dan RE (BE+RE) dan 2 jenis makanan hidup: rotifer, *Brachionus* sp. dan plankton telah diuji bagi mendapatkan makanan yang sesuai bagi lavi dan sekaligus mampu memberi kadar kehidupan yang tinggi. Hasil kajian menunjukkan lavi berupaya makan semua makanan yang diuji kecuali makanan hidup. Ini dapat dibuktikan melalui kandungan perut lavi. BE merupakan makanan yang mampu memberi kesan kehidupan yang paling tinggi kepada lavi ( $87.7 \pm 3.3$ ) berbanding lavi yang diberi makanan lain. Lavi ini berupaya untuk hidup selama 9 hari selepas menetas (dAH). BE dirumuskan sebagai makanan terbaik pada lavi dalam kajian ini berdasarkan kebolehannya untuk: hadir dalam pelbagai saiz (10-180  $\mu\text{m}$ ), menjadi makanan yang digemari, Chesson indeks  $\alpha$  (0.99), masa lalu usus yang pendek (30 minit), mempunyai nilai nutrisi yang baik, dan juga merupakan makanan yang mempunyai ciri-ciri yang mampu menarik minat lavi.

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Photo 4.2: The gut contents of *L. rivulatus* larvae fed with different feeds. **A**, BE was appeared as dark brownish and uneven shape in *L. rivulatus* gut; **B**, COJ was found as transparent oil-alike feed with various sizes; **C**, RE was found as brown water based feed in the *L. rivulatus* gut; **D**, BE+COJ was observed being similar as the combination characteristics of BE and COJ in the *L. rivulatus* gut; **E**, BE+RE was appeared as the combination characteristics of BE and RE in the *L. rivulatus*



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## LIST OF ABBREVIATIONS

%	percentage
&	and
µm	micrometer
AH	after hatching
BE	boiled egg yolk
BL	body length
BW	body weight
COJ	cod oil juice
DHA	docosahexaenoic acid
DO	dissolved oxygen
EPA	eicosapentaenoic acid
ESD	equilibrium spherical diameter
FAO	<i>Food and Agriculture Organisation</i>
FFA	free fatty acid
FRP	fibreglass reinforced plastic
g	gram
h	hour
hAH	hour after hatching
HDPE	high density poly ethylene
HP	house power
IU	international unit
kg	kilogram
kJ	kilojoule
/	litre
L	length
<i>m</i>	number of tested feed
mg	milligram
mL	mililiter
mm	millimetre

$n$	number
$^{\circ}\text{C}$	degree celsius
pH	potantra of hydrogeni (power of hydrogen)
ppt	part per thousand
$r$	r/ propotion
r.p.m	revolution per minute
RE	raw egg
$V$	volume
W	width
$\alpha$	alpha
$\pi$	pi

## CHAPTER 1

### INTRODUCTION

#### 1.1 HOI TAI KAI, *Lutjanus rivulatus*

*Lutjanus rivulatus* is classified in the genus of *Lutjanus*, class of Actinopterygii (ray-finned fishes), order of Perciformes (perch like), family of Lutjanidae (snappers); subfamily of Lutjaninae (Allen, 1985). The common names are White blotch snapper and Blubberlips (Allen, 1985). In Sabah, Malaysia, *L. rivulatus* is known by various names such as Ketambak, Konai, Nai Wong, Hoi Tai Kai, Hai Ti Chi and Siak Bong (Chin, 1998).

Many different names are given to *L. rivulatus* (Table 1.1) due to the wide distribution. *L. rivulatus* can be found in most tropical countries, particularly in Southeast Asia (Lee, 1998), such as Malaysia, Indonesia and Philippines, and other countries, namely Japan, Australia, Africa, United States of America and United Kingdom.

**Table 1.1** Names of *Lutjanus rivulatus* in different countries (Allen, 1985)

Country	Names
Africa	Speckled snapper
America	Blubberlips snapper
Australia	Maori-seaperch
China	Hai Ti Chi
Indonesia	Gaga
Japan	Nami-fuedai
Malaysia	Hoi Tai Kai
Philippines	Agak-agak

*L. rivulatus* is one of the most outstanding fish in the seafood industry (Polovina & Ralston, 1987; Department of Fisheries Sabah, 2004). In recent years, *L. rivulatus* has become one of the most expensive marine food fish (Senoo *et al.*, 2002; Department of Fisheries Sabah, 2004). In Kota Kinabalu, Sabah, *L. rivulatus* is sold for RM 120 -160 per kg in seafood restaurants (Own survey in July 2006). The meat quality of *L. rivulatus* is superior. This makes *L. rivulatus* often being the favorite food fish in both local and overseas markets.

Due to the meat quality, the demand for *L. rivulatus* in the seafood industry has gradually increased, while, the outstanding price has generated interest among seafood operators to commercialize *L. rivulatus* in order to gain higher profit (Chin, 1998). However, *L. rivulatus* is widely harvested from the wild to meet the increasing market demand. The continuous harvest of *L. rivulatus* has caused the population to decrease in the wild (Andrade, 2003). As a result, the supply of *L. rivulatus* has become insufficient, causing an imbalance in the market demand and supply (Andrade, 2003).

## **1.2 *L. rivulatus* SEED PRODUCTION IN UMS HATCHERY**

The inconsistent supply of *L. rivulatus* in the market has led to the need of the seed production. It is aimed to produce sufficient supply of *L. rivulatus* to the market. In 2004, the Marine hatchery of Borneo Marine Research Institute, Univerisiti Malaysia Sabah (UMS hatchery) has started the effort to produce *L. rivulatus* seeds through aquaculture. Broodfish of *L. rivulatus* were collected from the wild and reared in the UMS hatchery. Reared broodfish are consistently produce eggs under the artificial condition.



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